REMARKS

By this amendment, claims 1-12, 17-20, 26-32, 34-38 and 89-130 are pending in the application. Of these, claim 12 is being amended and claims 129-130 are being added. Claims 13-16 are being canceled. The claim amendments and new claims are supported by the specification and original claims, and no new matter is being added. Thus, entry of the amendments and reconsideration of the present case is requested.

Double Patenting Rejection of Claims 10-11, 17-18, 37-38 and 89-128

The Examiner rejected claims 10-11, 17-18, 37-38 and 89-128 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-66 of U.S. Patent No. 6,390,019 to Grimbergen et al in view of JP 9-126991 to Oshida et al. The Examiner indicated that a timely filed terminal disclaimer could be used to overcome the double patenting rejection provided the cited patent is commonly owned with this application.

U.S. Patent No. 6,390,019 to Grimbergen et al is commonly assigned to Applied Materials, and a terminal disclaimer in compliance with 37 CFR 1.321(c) will be filed by Applicant pending indication of the allow ability of the claims. Accordingly, the double-patenting rejection is now obviated.

Rejection Under 35 U.S.C. 102(b) of Claims 26-27, 29, 32 and 35-36

The Examiner rejected claims 26-27, 29, 32 and 35-36 under 35 U.S.C. 102(b) as being anticipated by JP 9-126991 to Oshida et al. This rejection is traversed.

Claim 26 is not anticipated by Oshida et al because Oshida et al does not teach "an overlying mask comprising a plurality of apertures having an aspect ratio that is selected to reduce deposition of process residues on the radiation transmitting portion," as recited in the claim. Instead, Oshida et al teaches a perforated opaque filter having holes (paragraph 26) that "filter away" milling particles from an optical system. Oshida does not teach that such particle filtering occurs from the aspect ratio of the holes. Rather, a "filter" typically operates by having filtering holes that block passage of particles because they have a diameter that is smaller than the diameter of the particles. In contrast, the present claim recites apertures having an aspect ratio that is predefined and determined to reduce deposition inside the hole, or in other words, apertures having a particular diameter to length ratio that serve to reduce the deposition of condensable material on the radiation transmitting portion. A mask having apertures with a predefined aspect ratio that is made up of a predefined length and corresponding predefined diameter selected according to a mathematical relationship between the two, is not the same structure as a filter hole having only a predefined diameter and that can have any arbitrary length. Thus, the mask having the apertures with the aspect ratio of claim 26 is not anticipated by Oshida et al.

Oshida et al further teaches that "the relationship between the hole pitch P and filter thickness t is optimized corresponding to the directionality of illuminating optical system (2)" (paragraph 26) where the pitch is equal to the diameter of the hole plus the distance between holes (Figure 4). However, this does not constitute a teaching towards an aperture having an aspect ratio selected to reduce deposition, as optimizing the relationship between the pitch (hole diameter and spacing between holes) and the filter thickness is not the same as providing a selected aspect ratio of a hole in a mask. Since the pitch is equal to the diameter of the hole plus the distance between holes (Figure 4), the relationship between the pitch and the thickness may be optimized independently of the aspect ratio. Additionally, Oshida et al does not teach or suggest providing an aspect ratio that reduces deposition, but instead teaches that the relationship between the pitch and the thickness is optimized "corresponding to the directionality of illuminating optical system" (paragraph 26),

to optimize the transmission of light. Accordingly, claim 26 and the claims depending therefrom are not anticipated by the teachings of Oshida et al

Furthermore, the mask of claim 26 having the apertures with the aspect ratio selected to reduce deposition is not obvious over Oshida et al, and represents a unique solution to the problem of deposition on windows and radiation transmitting elements. Rather than simply "filtering away" particles, for example by selecting a diameter that is too small to allow passage of particles into the apertures, the specification describes the mechanisms by which reduced deposition is provided by selecting the aspect ratio. The aspect ratio of the apertures is selected such that the process gas species are more likely to encounter a sidewall as they travel through the aperture towards the window, and not because the diameter of the aperture opening is smaller than the diameter of the process gas species. This is advantageous because, for example, a relatively larger aperture opening may be selected provided sufficiently long aperture lengths are selected to give the desired aspect ratio. This allows wider aperture openings for passing or receiving radiation through the mask apertures and window. Selecting hole diameters small enough to "filter away" milling material on the other hand, as in Oshida et al, may involve excessively narrowing the holes, and thereby reducing the amount of radiation that can pass through, which is undesirable.

In another embodiment taught in the specification, the aspect ratio is selected to be sufficiently small, or in other words, the length of the aperture is selected to be relatively small and the width of the aperture is selected to be sufficiently large, that highly directional and energetic plasma species are allowed to enter into the aperture to sputter-etch away process residues formed on the window. This represents a unique and non-obvious method of reducing deposition, by actually allowing selected components of the process gas to pass through the aperture to etch away residue from the window. The apertures having aspect ratios selected to reduce deposition in this manner is not taught or suggested by Oshida et al. In fact, Oshida et al teaches away from aspect ratios selected

to reduce deposition in this manner by teaching the "filtering away" of milling particles from the optical system, and thus teaching the desirability of keeping process gas and by-products from reaching the optical system as opposed to allowing the process gas to reach and clean the optical system.

Accordingly, the window having the mask with the apertures having aspect ratios selected to reduce deposition is not obvious over Oshida et al because Oshida does not teach or suggest that deposition could be inhibited by selecting the aspect ratio of the aperture. Thus, claim 26 and the claims depending therefrom are patentable over Oshida et al.

Rejection Under 35 U.S.C. 103(a) of Claims 1-9, 12-16, 19, 20, 28, 30, 31 and 34

The Examiner rejected claims 1-9, 12-16, 19, 20, 28, 30, 31 and 34 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,290,383 to Koshimizu et al in view of Oshida et al. This rejection is traversed.

Claim 1 is patentable over Koshimizu et al in view of Oshida et al because neither of the references teaches or suggests "a mask overlying the radiation transmitting portion, the mask having an aperture comprising an aspect ratio that is selected to reduce deposition of process residue on the radiation transmitting portion," as recited in the claim. Koshimizu et al teaches a plasma etching reactor with a window, but does not teach or suggest a mask having an aperture comprising an aspect ratio selected to reduce deposition. Oshida et al also fails to teach or suggest a mask comprising an aperture with the aspect ratio selected to reduce deposition, as discussed above. Accordingly, claim 1 and the claims depending therefrom are patentable over Koshimuzu et al in view of Oshida et al.

Similarly, claim 12 is patentable over Koshimizu et al in view of Oshida et al

because the references fail to teach or suggest "a mask overlying the radiation transmitting portion, the mask having an aperture comprising an aspect ratio that is selected to reduce deposition of process residue on the radiation transmitting portion." Instead, as discussed above, neither Koshimizu et al or Oshida et al teach or suggest a mask comprising an aperture having the aspect ratio. Furthermore, the references fail to teach or suggest the recited aspect ratio of from about 1:1 to about 12:1. Thus, claim 12 and the claims depending therefrom are patentable over Koshimizu et al in view of Oshida et al.

Claim 19 recites "a radiation transmitting portion comprising a mask with a plurality of apertures, the apertures having an aspect ratio that is selected to reduce deposition of process residues on the radiation transmitting portion," and thus this claim and the claims depending therefrom are also patentable over Koshimizu et al in view of Oshida et al because neither of the references teach or suggest the claimed mask.

Claim 26, from which claims 28, 30-32 and 34 depend, is patentable over Oshida et al for at least the reasons given above, namely Oshida et al does not teach or suggest the claimed mask having the apertures with the aspect ratios. Koshimizu et al also does not teach or suggest the claimed mask, and thus claim 26 and the claims depending therefrom are patentable over Koshimizu et al in view of Oshida et al.

CONCLUSION

The above-discussed amendments and remarks are believed to place the present application in condition for allowance. Should the Examiner have any questions regarding the above remarks, the Examiner is requested to telephone Applicant's representative at the number listed below.

Respectfully submitted,

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MARKED-UP CLAIMS FOR S/N: 09/610,237

12. (amended) A substrate processing chamber comprising:

(a) a support having a receiving surface capable of supporting a substrate;

(b) a gas distributor capable of providing process gas in the chamber and a gas energizer that is capable of coupling energy to the process gas;

(c) a radiation transmitting portion that allows radiation to be transmitted therethrough to monitor processing of the substrate;

(d) [means extending into the interior of the chamber for reducing deposition of process residue from process gas on the radiation transmitting portion] a mask overlying the radiation transmitting portion, the mask having an aperture comprising an aspect ratio that is selected to reduce deposition of process residue on the radiation transmitting portion, the aspect ratio being from about 1:1 to about 12:1; and

(e) an exhaust capable of exhausting process gas from the chamber.